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REPORT ON DAMAGES TO OYSTER RESOURCES IN TEXAS PRIVATE LEASES 390A, 391A, 392A & 432A DUE TO CHEMICAL SPILL ON MAY 10, 2019

Located in
GALVESTON BAY
GALVESTON COUNTY, TEXAS

Prepared for

SHRIMPS R US

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MAY
2021

Exhibit 7

DAMAGES TO OYSTER RESOURCES IN LEASES 390A, 391A, 392A, 427A & 432A FROM CHEMICAL SPILL ON MAY 10, 2019

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DAMAGES TO OYSTER RESOURCES IN LEASES 390A, 391A, 392A, 427A & 432A FROM CHEMICAL SPILL ON MAY 10, 2019

EXECUTIVE SUMMARY

On May 10, 2019, the towboat *M/V Voyager* and two tank barges, *Kirby 30015T* and *MMI 3041,* owned and operated by Kirby Inland Marine, LP (Kirby), collided with the tanker *VLGC Genesis River*, owned by FPG Shipholding Panama 47 S.A. (FPG), and operated by K Line Energy Ship Management Co., Ltd (K Line), in the Bayport shipping channel, in Galveston Bay, Texas. One of the Kirby barges capsized, and the other barge's hull was penetrated. Each barge was carrying approximately 25,000 barrels of gasoline blend stock reformate. According to the National Transportation Safety Bureau report (NTSB 2021) approximately 11,000 barrels spilled into the channel.

Gasoline blend stock reformate is a mix of gasoline blending components, namely mono-aromatic hydrocarbons (benzene, toluene, ethyl benzene, xylene), commonly referred to as BTEXs, and poly-aromatic hydrocarbons (naphthalene, flourene, dibenzothiphene, anthracene), commonly referred to as PAHs. BTEXs and PAHs comprise upwards of 99% of the water-soluble components of crude oil and gasoline fluids, and PAHs in particular are explicitly used as a measure for potential contamination following oil spills.

The entirety of the aforementioned chemical spill was comprised of these components most dangerous to marine wildlife, and had drastic effects on the local oyster populations, as noted by photographic evidence of mortality by the leaseholder, and subsequently quantified extremely high mortality rates (**53.92%** above natural average on Texas Leases 390A, 391A, and 392A, **38.47%** above the natural average of 427A and **54.53%** above natural average on 432A).

Based on samples taken in August 6, 2019, the leases in question had a total standing crop density of **906, 1143, and 2086** boat sacks/acre (390-392A , 427A and 432A, respectively) at the time of the chemical spill. With **171.36** acres of oyster producing reef and cultch material across all four leases, at a discounted monthly average price of **$67.46** per boat sack, the chemical spill caused the death of **87,513.75** boat sacks of seed and sack oysters, resulting in a loss of **$5,903,677.58** due to damage to standing crops on the five leases.

METHODS

MREC Sampling

All surveys and sampling by MREC were performed on a 30 ft. custom fiberglass, twin outboard motor research vessel with ~1.5 ft. draft. Navigation for sonar was performed using a Trimble SP351 sub meter DGPS receiver and SPS MSK antenna, operated with *Hypack* and/or Chesapeake Technology Inc. *Sonar Wiz 7* software.

Dive samples were performed at non-random sampling locations. The surveyors found the areas of high shell or cultch and took soundings with a 20 ft. aluminum pole to verify location. The surveyors on SCUBA then placed a 1 m^2 aluminum quadrat on the bottom in areas of high shell or cultch concentration, found by hand after a quick bottom analysis. All cultch material and shell were placed into a steel basket from the top 6" of the cultch piles, and brought aboard the vessel. Samples were rinsed and photographed in basket, then bagged and put on ice until they could be analyzed.

Standing Crops and Potential Crop Calculation

The live oysters were totaled for the three main size categories: Spat (1-25 mm), Seed (26-75 mm), and Market (76 mm+), and at 300 oysters/ boat sack, discounting spat by 90%, and seed by 50% for potential crop), the total sacks per acre were calculated for each toss/sample according to the following formula:

$$\frac{Sacks}{Acre} = \left(\left(\frac{Market}{m2}\right) + 0.1\left(\frac{Spat}{m2}\right) + 0.5\left(\frac{Seed}{m2}\right)\right) * \frac{4047\ m2}{acres} * \frac{1\ boat\ sack}{300\ oysters}$$

In order to calculate an accurate standing crop density at the time, a mortality percentage was calculated from the samples taken in August, 2019 based on the percent of recent dead found in the samples. Percent mortality attributed to the chemical spill was calculated according to the following formula:

$$\%\ mortality\ due\ to\ chemical\ spill = (\%\ recent - \%\ mean\ natural)$$

Where mortality is calculated as:

$$\%\ mortality = \left(\frac{recent\ dead}{live+recent\ dead}\right) * 100$$

In order to accurately assess the lost standing crop density at the time of the spill, counts for live and recent dead seed and sack oysters were combined together, representing the total

amount of oysters that were present at the time of the spill, and the result was then reduced by the mortality percentage attributed specifically to the chemical spill:

$$\frac{Lost\ Sacks}{Acre} = \left(\frac{\%\ mortality\ due\ to\ chemical\ spill}{100}\right) * \left(\left(\frac{Market}{m2}\right) + 0.5\left(\frac{Seed}{m2}\right)\right) * \frac{4047\ m2}{acres} * \frac{1\ boat\ sack}{300\ oysters}$$

Spat oysters were not utilized in the calculation of the standing crop density nor the mortality percentages attributed to the chemical spill, as the samples were taken two months after the incident, and only live spat were found on the samples, indicating recruitment after the incident.

The formula for finding the lease area conversion factor was calculated as follows:

$$Conversion\ Factor = \frac{\left(\frac{430A\ density\ 2015}{390-2A\ density\ 2015}\right) + \left(\frac{430A\ density\ 2016}{390-2A\ density\ 2016}\right) + \left(\frac{430A\ density\ 2017}{390-2A\ density\ 2017}\right)}{3}$$

Standing crop values were calculated using a monthly average price over a year span from June 2020, through June 2021, discounted by $5 for harvesting cost.

Acreage calculations

In 2015, poling surveys were performed by utilizing water bottom soundings, taken using a 20 ft. aluminum pole, every 50 - 65 ft. on parallel transects 200 ft. apart. Polygons were then drawn equally spaced around the soundings of each water bottom type, and the relative percentages and acreages calculated. This resulted in the initial acreage calculations.

Personal communication from the lease operators indicated that in 2017, a number of cubic yards of cultch material were planted on the three leases in order to increase oyster holding acreage. The increased acreage was calculated according to the following formula:

$$acres\ new\ cultch\ bed = cubic\ yards\ cultch * \left(\frac{1\ acre}{500\ cy\ cultch}\right)$$

The lease operators indicated that they spread the cultch at approximately 500 cy/acre in order to achieve a 6” cultch bed.

Total acreage was the combination of the acreage found on the 2015 poling surveys and the cultch material that was planted after the 2015 survey and before May 10, 2019.

DISCUSSION

In the years prior to the chemical spill in 2019, MREC was tasked with surveying the three leases repeatedly, and so have relevant data standing crop densities, natural mortalities, and acreage calculations of oyster bearing water bottoms for the leases 390A, 391A, and 392A. Water bottom surveys were performed in 2015, and oyster samples were taken in 2015, 2016, and 2017 (after Hurricane Harvey). Dive samples were taken again in August of 2019, two months after the chemical spill. For the purposes of this report and simplification of reporting damage, as the three leases are immediately adjacent to each other (Appendix A, Figure 1), the data for all three leases were combined and treated as one lease area.

Standard procedure for oil or chemical spills is to lay out booms on the surface of the water surrounding the spill area. This contains the oil products to a confined area, which float along the surface, and can either be removed from the surface, or evaporate naturally. This is most effective for those light oil components which are not water-soluble and float at the surface. Booms were put in place during this spill. However, the reformate which spilled into Galveston bay was comprised of BTEXs and PAHs in its entirety, which is known to have direct impacts on marine life, in particular marine invertebrates (DOI ERP/PEIS). BTEXs and PAHs are the most water-soluble components of oil byproducts and are targeted as measures for potential contaminations (NOAA 2002). Due to the high solubility, even with booms in place, a large amount of the spilled chemical was distributed throughout the water column. PAHs in particular can have lethal and sublethal effects on *C. virginica*, affecting eggs and sperm in the water column, larvae, and all life stages (DOI, ERP/PEIS).

It is readily apparent that the chemical spill had a devastating effect on the standing crop of oysters throughout the area of Galveston Bay. Multiple lease operators in the Galveston Bay area noted shortly after the spill that oysters harvested were found to be recently dead, noting high numbers of open boxes, with oyster flesh still inside (Appendix A, Figure 2). MREC was contacted in order to accurately survey some of the leases in question and accurately estimate the standing crop which was lost.

A simple comparison of mortalities found in the surveys from 2015 to 2019, shows just how devastating the chemical spill was to the oysters in the spill area (Appendix A, Figure 3). On three separate lease areas in Galveston Bay, mortality data was known from 2015, 2016, and 2017. Discounting for natural mortality averages from 2015-2017, estimates from the 2019 survey due to the chemical spill are 53.92%, 56.53%, and 54.53% for the lease areas 390-2A, 430A, 427A and 432A respectively (Appendix B, Table 1).

DAMAGES TO OYSTER RESOURCES IN LEASES 390A, 391A, 392A, 427A & 432A FROM CHEMICAL SPILL ON MAY 10, 2019

It is quite obvious that the chemical spill in May, 2019 had a direct and immediate impact on the oyster crops in Galveston Bay. It was noted, however that by August of 2019, new spat had resettled into the three leases, as indicated by the presence of only live spat on the surveys. This indicates that the chemical will likely have minimal long term impacts on the condition of the reef and cultch structures themselves, but only on the oysters that were alive at the time. Therefor, in order to appropriately assess the value of the damages to the oyster standing crops at the time of the spill, mortalities and densities were calculated without the spat counted on the August, 2019 survey.

As standing crop density data had been collected on both the 432A and the 390-392A lease areas in 2015-2017, and no samples were taken in the 432A lease in 2019, a conversion factor was calculated in order to give an accurate density estimate for 427A and 432A. Throughout 2015, 2016, and 2017, lease 427A was on average **1.26** times as dense in standing crop as the 390-392A lease areas and lease 432A was on average **2.30** times as dense in standing crop. (Appendix B, Table 2).

By combining the recent dead oysters with those still alive during the survey for the seed and sack oysters, an accurate standing crop density was calculated for the lease area. Standing crop densities for the 390-392A, 427A and 432A lease areas were **906, 1143** and **2086** boat sacks/acre at the time of the chemical spill. This density is within the normal margin of variability noted on the leases over the years (Appendix B, Table 3), as 2015 and 2017 were both noted to have higher freshwater influx compared to other years, and as such were found to have been less productive than the year with average freshwater influx (2016).

Water bottom surveys from 2015 (Appendix A, Figures 4, 5, 6, 7) show the high amount of reef and cultch present across leases 390A, 391A, 392A, and 432A totaling 134.29 acres of oyster bearing material. In 2017, the lease operators deposited 9080.36 cubic yards of crushed limestone rock cultch material equally across the 390-392A leases. At a rate of 500 cubic yard per acre, the cultch material deposited covers an additional 18.16 acres (Appendix B, Table 3). No additional material was added to lease 432A. At the time of the chemical spill, the five leases combined contained **171.36** acres of oyster bearing material (**141.36** in 390-392A, **18.3** in 427A and **11.7** in 432A) which were negatively impacted due to the incident.

As the standing crop values are calculated based on both seed and sack oysters, fair market value was calculated by averaging the monthly sack cost from June 2019 through June of 2021, then discounted by $5 for harvesting costs (Appendix B, Table 5). The mean discounted monthly price is **$67.46**.

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Given the acreage of viable oyster habitat of 141.36 acres, and documented standing crop density of 906 boat sacks/acre for 390-392A, and 18.3 acres at 1143 boat sacks/acre for 427A and 11.7 acres at 2086 boat sacks/acre for 432A, utilizing a discounted mortality due specifically to the chemical spill of 53.92% for leases 390-2A, 38.47% for lease 427A and 54.53% for lease 432A, the spill cause a total combined loss of **69,059.71** boat sacks of oysters for 390-392A, **5143.15** boat sacks for 427A and **13,310.89** boat sacks for 432A. At the discounted mean market rate of **$67.46**/boat sack, the standing crop loss for leases 390-2A, 427A and 432A, respectively, was **$4,658,874.04, $346,964.87** and **$897,973.42.** Total standing crop value lost for all leases in question was **$5,903,677.58**.

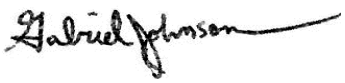
In addition, due to extremely high mortality and huge standing crop loss the value of cultch material needed to recruit spat and revitalize the reef must be considered. Planting new rock, oyster shells or other cultch materials is crucial to recruiting spat (baby oysters), especially after a chemical spill, because it ensures clean untainted surface area for spat to set and grow. While it is expected that oysters will continue to slowly grow and come back on the existing reef materials, the planting of the of fresh new cultch material is crucial to quickly revitalize the oyster reef and minimize the recovery time it takes the lease to get back to normal rated of productivity prior to the May 2019 spill.

In the months following the spill, 2,961.61 cubic yards of limestone cultch material was added to lease 391A at a cost of **$248,775.00** ($84 per cubic yard).

In total this oyster lease suffered a standing crop loss of $5,903,677.58 and spent and an additional $248,775.00 on oyster shell cultch planting for a combined **total financial loss of $6,152,452.58** for the five Shrimps R Us oyster leases affected by the May 10, 2019 spill.

MREC Environmental, reserves the right to update the information in this report in the future if and when more data is collected.

Submitted: May 17, 2021



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MREC Environmental, LLC

APPENDIX A - Figures

Figure 1. Map of Galveston Bay and private oyster leases. Relevant leases and the site of the vessel collision are noted. The inset map shows the three conjoined leases 390A, 391A, and 392A.

Figure 2. A) dredge samples harvested on leases 390A, 391A, and 392A. B) Dredge samples harvested on lease 430A. Note the high number of recent dead boxes, many with oyster tissue still remaining inside.

DAMAGES TO OYSTER RESOURCES IN LEASES 390A, 391A, 392A, 427A & 432A FROM CHEMICAL SPILL ON MAY 10, 2019

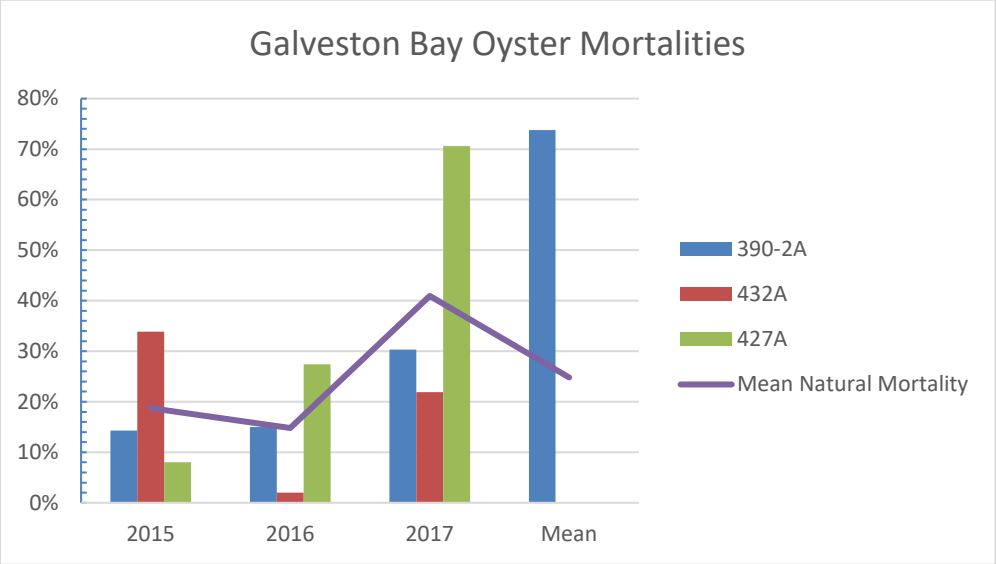

Figure 3. Mortality rates from three non-adjacent lease areas during 4 different sample years. 2015, 2016, and 2017 indicate natural variability, including high freshwater due to Hurricane Harvey in 2017. 2019 samples were taken following the chemical spill.

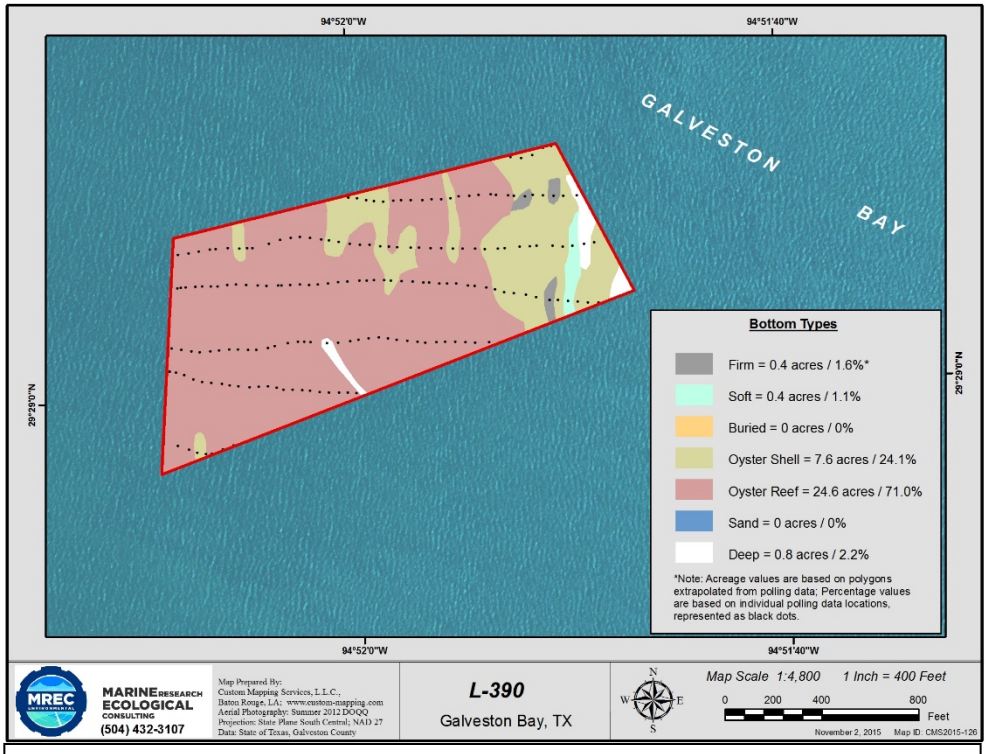

Figure 4. Water bottom types and acreage for 390A.

DAMAGES TO OYSTER RESOURCES IN LEASES 390A, 391A, 392A, 427A & 432A FROM CHEMICAL SPILL ON MAY 10, 2019

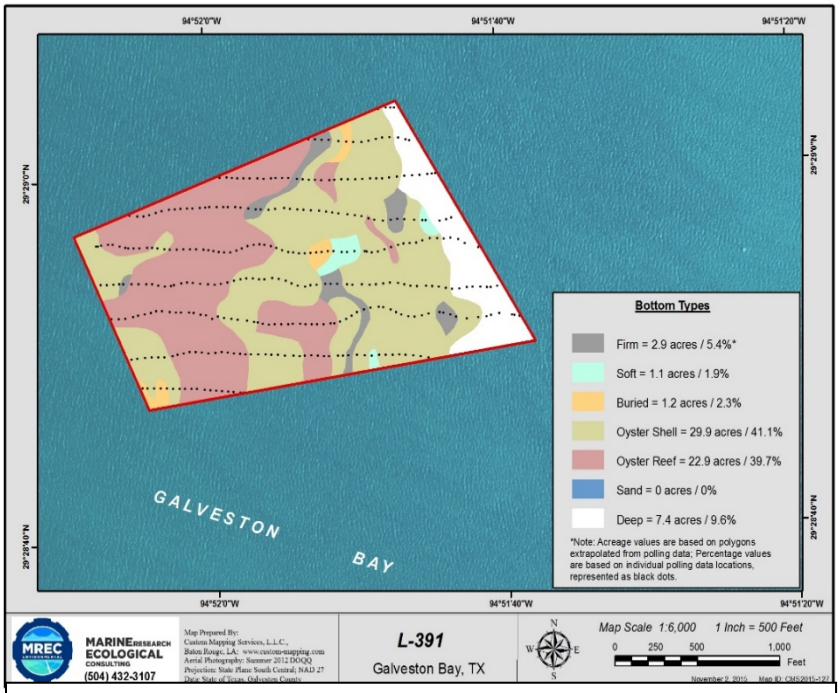

Figure 5. Water bottom types and acreage for 391A.

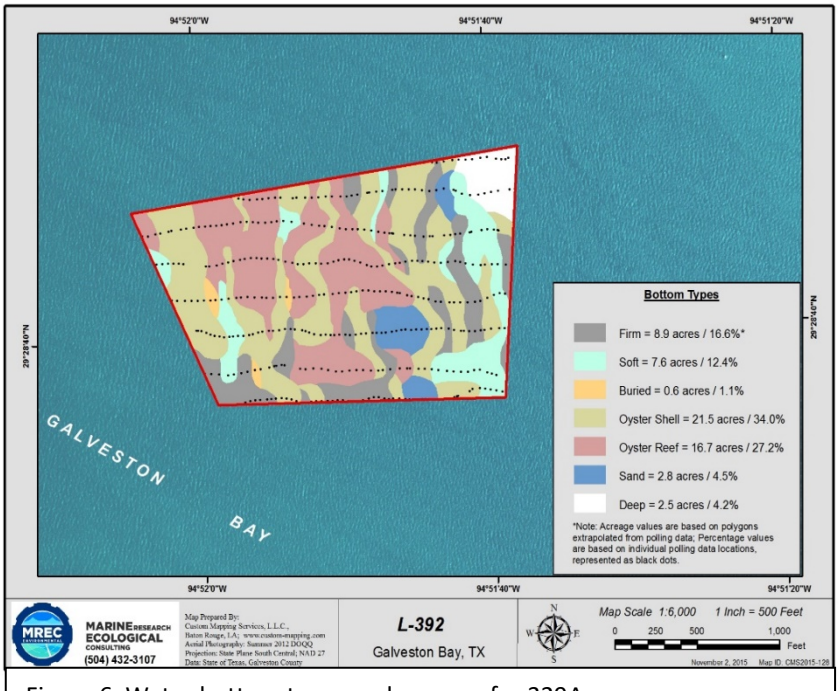

Figure 6. Water bottom types and acreage for 329A.

DAMAGES TO OYSTER RESOURCES IN LEASES 390A, 391A, 392A, 427A & 432A FROM CHEMICAL SPILL ON MAY 10, 2019

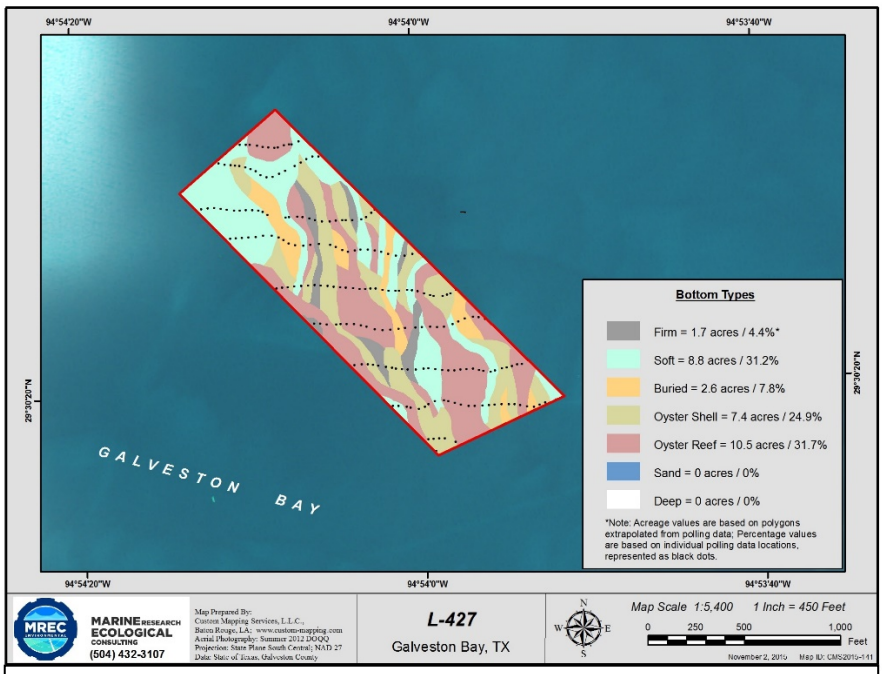

Figure 7. Water bottom types and acreage for 427A.

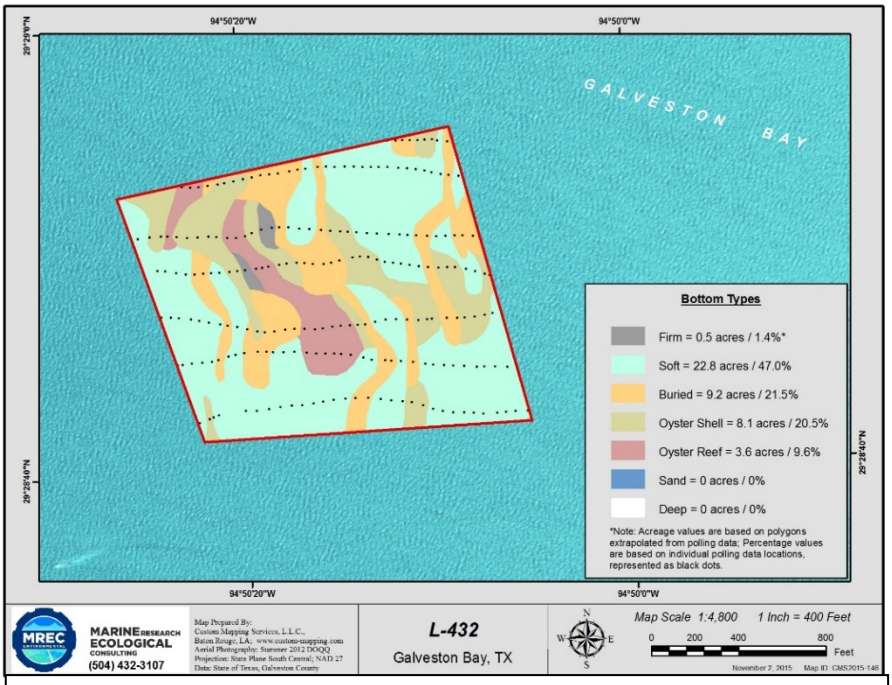

Figure 8. Water bottom types and acreage for 432A.

APPENDIX B – Tables

Table 1. Percent mortality of recently dead oysters in sample			
Year	**390-392A**	**427A**	**432A**
2015	14.30%	8.00%	33.90%
2016	15.00%	27.0%	2%
2017	30.33%	70.60%	21.90%
Mean Natural Mortality	19.88%	35%	19.27%
2019 Discounted for Natural	**53.92%**	**38.47%**	**54.53%**

Table 2. Conversion factor between lease areas 390-392A and 427A, 432A.					
	Boat Sacks/Acre			Conversion Factor	
Year	427A	432A	390-392A	427A	432A
2015	683	196.5	321.6	2.12	0.61
2016	809	2644.8	991.8	0.82	2.67
2017	262	1126.2	310.22	0.84	3.63
			Mean	1.26	2.30

Table 3. Standing crop densities (boat sacks/acre)			
Year	390-392A	427A	432A
2015	321.6	2.12	196.50
2016	991.8	0.82	2644.80
2017	310.22	0.84	1126.20
2019	**906**	**1143**	**2086.2**

Table 4. Cultch deposition post 2015 water bottom surveys for 390-392A			
Year	Cultch Volume (Cubic Yards)	Cultch Deposition Rate (Cubic Yards/Acre)	Acres of Cultch
2017	9080.36	500	**18.16**

DAMAGES TO OYSTER RESOURCES IN LEASES 390A, 391A, 392A, 427A & 432A FROM CHEMICAL SPILL ON MAY 10, 2019

Table 5. Mean monthly oyster sack prices	
Jun-19	$65
Jul-19	$65
Aug-19	$65
Sep-19	$75
Oct-19	$75
Nov-19	$75
Dec-19	$75
Jan-20	$75
Feb-20	$75
Mar-20	$75
Apr-20	$75
May-20	$75
Jun-20	$72
Mean Monthly	**$72.46**

REFERENCES

DOI ERP/PEIS. Department of the Interior, ERP/PEIS Part Two: Chapter 4 through Chapter 9

NOAA 2002. National Oceanic and Atmospheric Administration, Office of Response and Restoration Managing Seafood Safety after and Oil Spill, Yender, R. et al. 2002

NTSB 2021. National Transportation Safety Board. Marine Accident Report, Collision between Liquefied Gas Carrier *Genesis River* and *Voyager* Tow. March 2020.